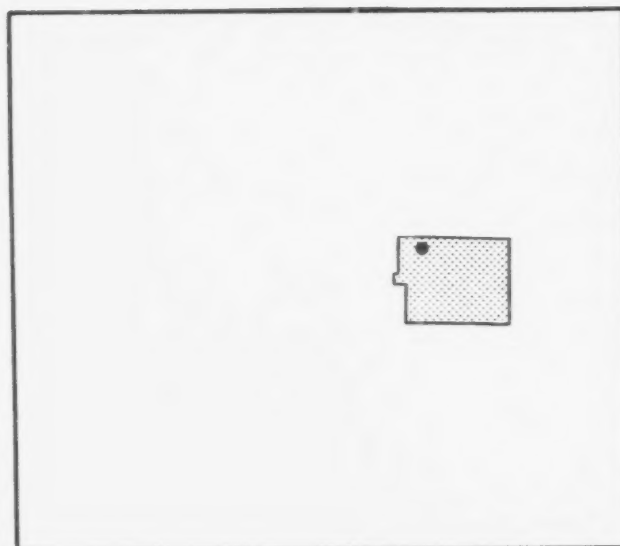


FLOOD INSURANCE STUDY



TOWN OF
MONUMENT,
COLORADO
EL PASO COUNTY



SEPTEMBER 29, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER - 080064



KW

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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Dirty Woman Creek

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FLOOD INSURANCE STUDY
TOWN OF MONUMENT, EL PASO COUNTY, COLORADO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Monument, El Paso County, Colorado, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

This Flood Insurance Study was prepared by compiling pertinent information for the flood hazard areas in the Town of Monument from existing technical and/or scientific data originally prepared by others.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses used to prepare this study were performed by the Colorado Water Conservation Board. That work was completed in June 1986.

1.3 Coordination

On August 7, 1987, the Federal Emergency Management Agency (FEMA) notified the Town of Monument that a Flood Insurance Study was being prepared for the community.

On December 12, 1988, the results of this study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Monument, El Paso County, Colorado. The areas of study are shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods within the Town of Monument: Crystal Creek, for its entire length within the community, a reach of approximately 1 mile; and Dirty Woman Creek, for a reach of approximately 1 mile.

2.2 Community Description

The Town of Monument is located in Central Colorado, approximately 20 miles north of Colorado Springs. According to 1980 census data, Monument has a population of 690, an increase of 297 from 1970 (Reference 1). Approximately 20 inches of precipitation fall on Monument annually (Reference 2).

2.3 Principal Flood Problems

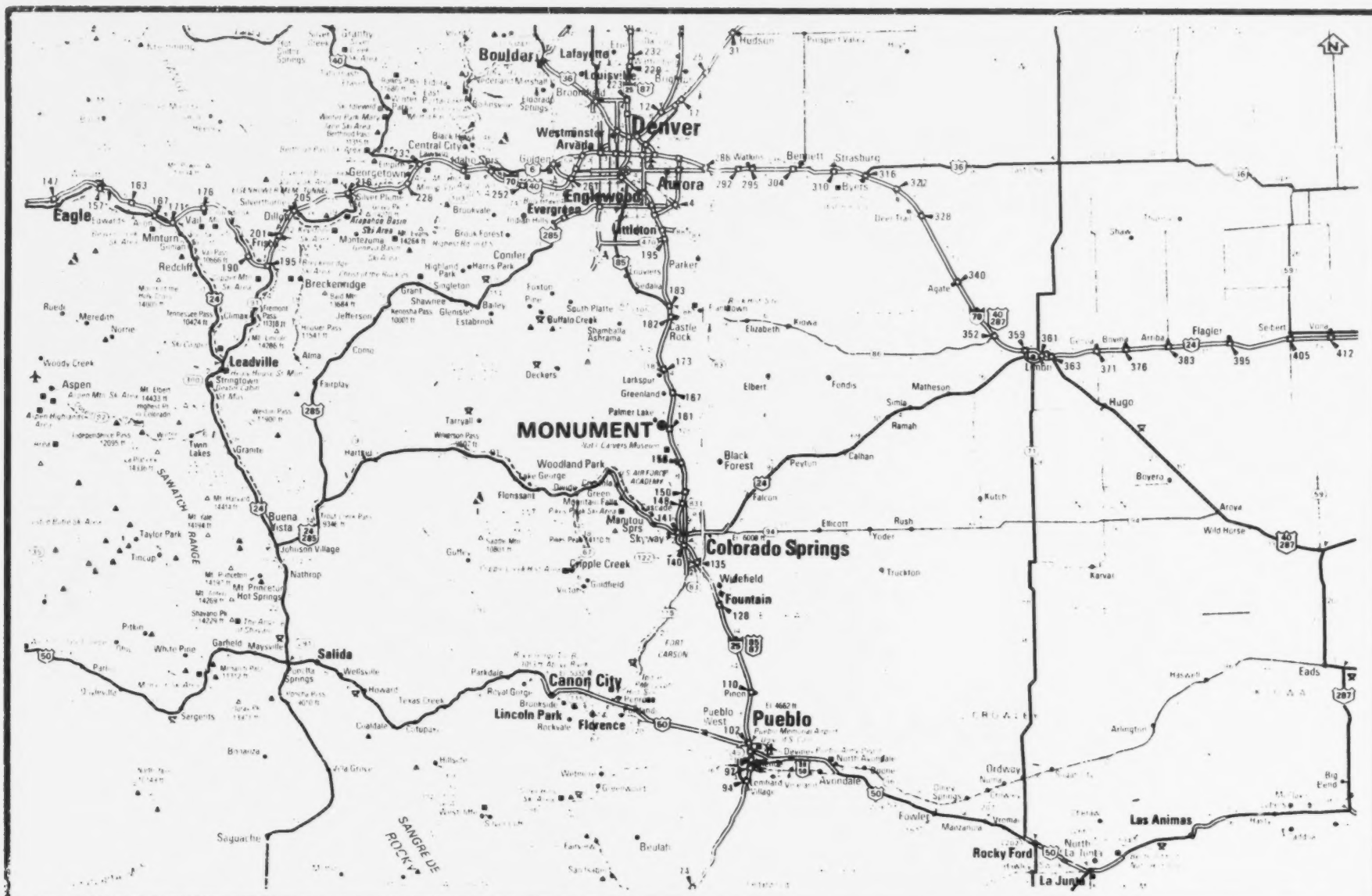
No information exists documenting the flood history of either Crystal Creek or Dirty Woman Creek.

2.4 Flood Protection Measures

No flood protection measures have been taken for the area within the Town of Monument.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods, of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increase when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.



FEDERAL EMERGENCY MANAGEMENT AGENCY

STATE OF MICHIGAN, CO
OF PAGO COUNTY)

APPROXIMATE SCALE

23	9	23	46	69MILES
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VICINITY MAP

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The hydrologic analysis used for this study was obtained through the Colorado Urban Hydrograph Procedure, developed by the Town Drainage and Flood Control District. This method is specified for ungaged drainage areas greater than 160 acres in the (preliminary) Storm Drainage Criteria Manual for the Town of Monument. Significant parameters used in the hydrologic calculation, are rainfall values for the 10-, 50-, and 100-year 1 hour rainfalls; the Soil Conservation Service (SCS) soil type, and the percent impervious area. The 500-year peak flow for each basin was derived by an extrapolation of a plotting of the 10-, 50-, and 100-year peak flows for each creek on log probability paper. Hydrology for Crystal Creek was consistent with a hydrologic analysis of the 100-year peak flow performed by Tri-Consultants for Casey's subdivision located along Crystal Creek between Interstate Highway 25 and Beacon Light Road. Tri-Consultants used the SCS method to determine the 100-year peak flow.

Peak discharge-drainage area relationships for Crystal Creek and Dirty Woman Creek are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (SQ MILES)</u>	<u>PEAK DISCHARGES (cubic feet per second)</u>			
		<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>	<u>500-YEAR</u>
Crystal Creek	0.75	240	510	640	1,050
Dirty Woman Creek	5.0	1,230	2,620	3,360	5,800

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the riverine sources studies were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Bridge elevations and sizes of openings were surveyed and measured in the field on February 3 and 4, 1986. These data were combined with cross-section data taken from a 5-foot contour mapping of the Town of Monument (Reference 3). These cross-section data were used as the input data in the U.S. Army Corps of Engineers (COE) HEC-2 step-backwater computer program (Reference 4).

Water-surface elevations of floods of the selected recurrence intervals were computed through the use of the COE HEC-2 step-backwater computer program.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). Selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Roughness coefficients (Manning's "n" values) for Crystal Creek varied from 0.020 to 0.400 for the channel and from 0.025 to 0.045 for the overbank areas. Roughness values for Dirty Woman Creek varied from 0.025 to 0.050 for the channel and from 0.025 to 0.050 for the overbank areas.

Culvert capacities are sufficient to pass the 100-year flow at all but two stream crossings. Both Beacon Light Road over Crystal Creek and the Denver Road over Dirty Woman Creek are inadequately sized. The backed-up water temporarily floods only unused barren land and the peak flows downstream from these roads are attenuated to a certain degree during high frequency flooding events (common flood events). Should the land upstream from either road be developed, the culvert size should be increased.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study are based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum (NGVD) of 1929. Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section.

Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000, with a contour interval of 20 feet (Reference 5).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zone AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follow:

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zone and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains and the locations of selected cross sections used in the hydraulic analysis.

7.0 OTHER STUDIES

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by other organizations originally for purposes other than the NFIP. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood

Insurance Study and the NFIP. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, Federal Emergency Management Agency, (FEMA), Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267 for consideration for revision of this study.

Another floodplain analysis of Crystal Creek was completed by Tri-Consultants for the reach along Casey's subdivision. Casey's subdivision 85-87 is located between Interstate I-25 and Beacon Light Road.

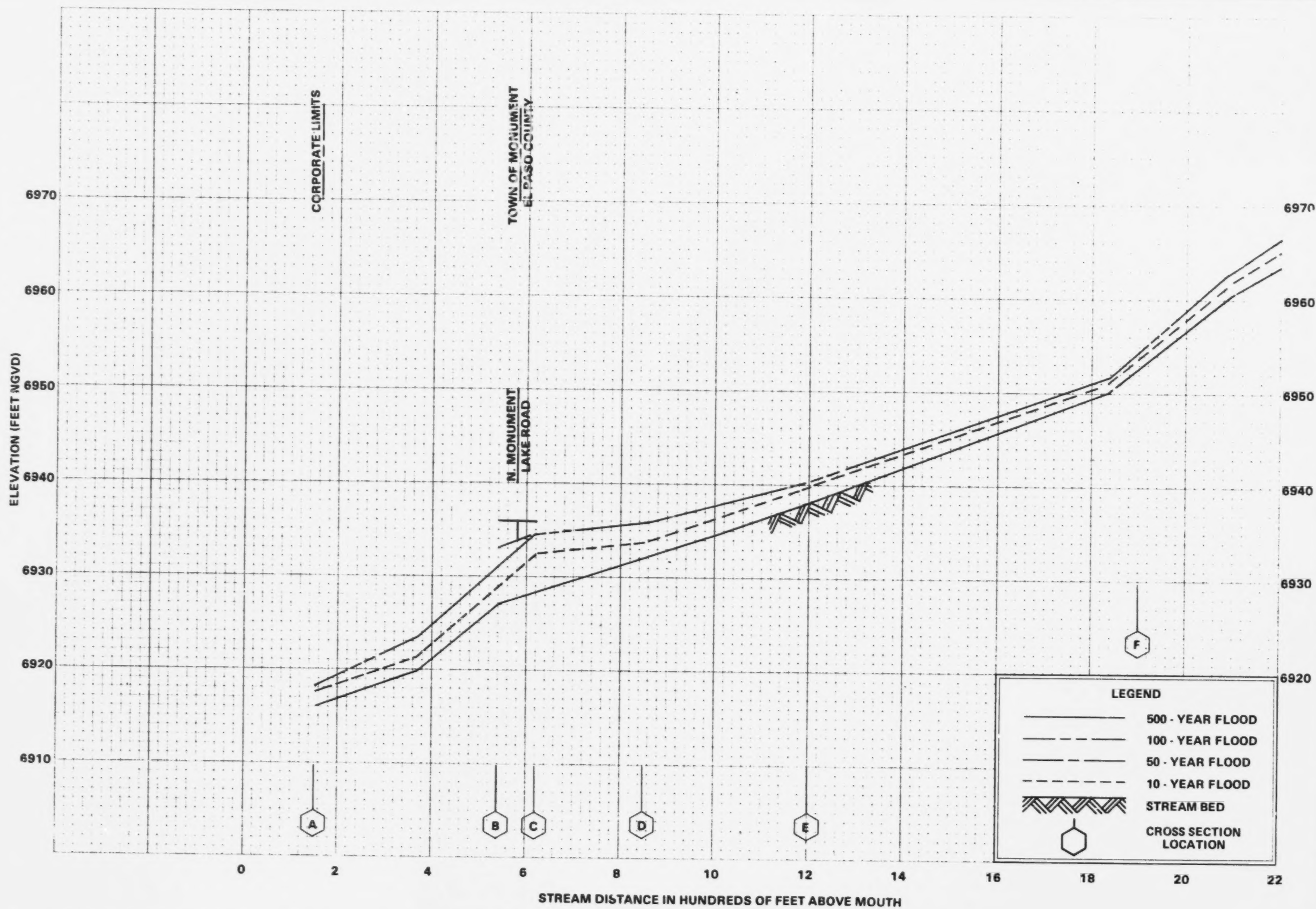
This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, (FEMA), Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267.

9.0 BIBLIOGRAPHY AND REFERENCES

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2. Viessman, Warren Jr., John W. Knapp, Gary L. Lewis, Terrance E. Harbough Introduction to Hydrologic, Second Edition, P.27, 1972.
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5. U.S. Department of the Interior, Geological Survey, 7.5 Series Topographic Maps, Scale 1:24000, Contour Interval 20 feet, Monument, Colorado, 1961 (photorevised 1969 and 1975).



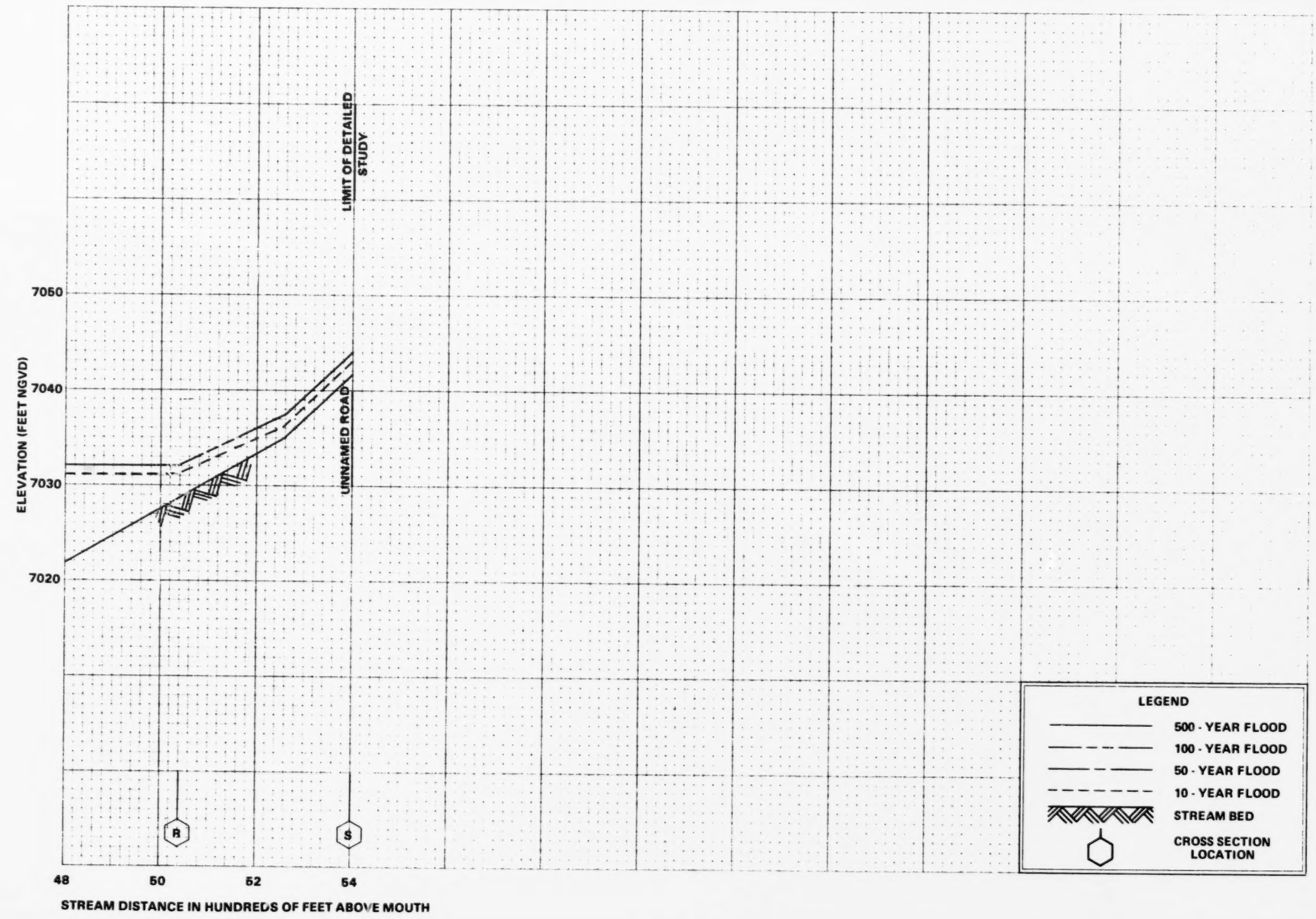
FLOOD PROFILES

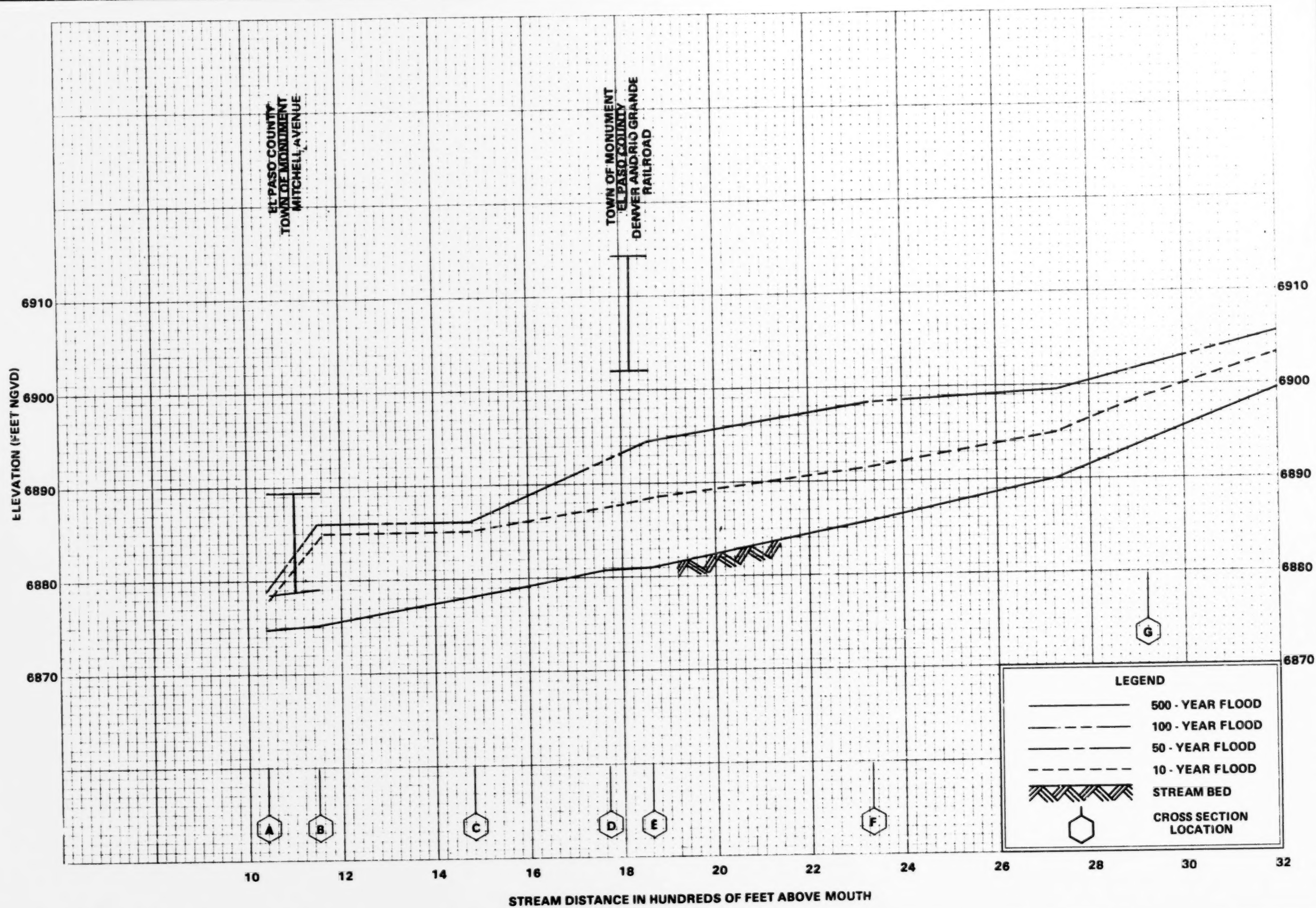
CRYSTAL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF MONUMENT, CO
(EL PASO CO.)

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FLOOD PROFILES

DIRTY WOMAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF MONUMENT, CO
(EL PASO CO.)

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